CLAIMS

What is claimed is:

Claim 1. An apparatus to provide information useful to determine the resistivity of a geological formation from within a cased well, comprising:

a first electrode that electrically engages a first particular section of casing at a specific depth within the well for receiving first signals having voltage related information;

a second electrode that electrically engages the first particular section of casing for receiving second signals having voltage related information located a first distance above said first electrode wherein the magnitude of the resistance of the portion of casing between said first and second electrodes is the first resistance;

a third electrode that electrically engages the first particular section of casing for receiving third signals having voltage related information located a second distance below said first electrode wherein the magnitude of the resistance of the portion of casing between said first and third electrodes is the second resistance;

a fourth electrode that electrically engages the casing at a point located a third distance above said second electrode;

a fifth electrode that electrically engages the casing at a point located a fourth distance above said fourth electrode;

means to conduct a first current from said fourth electrode to said fifth electrode, whereby said fourth distance is chosen such that at least a portion of said first current flows into the formation of interest;

means to measure said first resistance and said second resistance;

means for processing said first, second and third signals from said first, second, and third electrode means thereby providing information useful to determine the resistivity of the formation of interest, said means for processing taking into account a magnitude relating to the values of said first resistance and said second resistance so that inaccuracy associated with the determination of the resistivity is reduced.

Claim 2. A method to provide information useful to determine the resistivity of a geological formation from within a cased well, comprising:

providing an apparatus having a first electrode that electrically engages a first particular section of casing for receiving first voltage related signals at a specific depth within the well;

said apparatus having a second electrode that electrically engages the first particular section of casing for receiving second voltage related signals located a first distance above said first electrode wherein the magnitude of the resistance of the portion of casing between said first and second electrodes is the first resistance;

said apparatus having a third electrode that electrically engages the first particular section of casing for receiving third voltage related signals located a second distance below said first electrode wherein the magnitude of the resistance of the portion of casing between said first and third electrodes is the second resistance;

said apparatus having a fourth electrode that electrically engages the casing at a point located a third distance above said second electrode;

said apparatus having a fifth electrode that electrically engages the casing at a point located a fourth distance above said fourth electrode;

said apparatus having means to conduct a first current between said fourth and fifth electrodes, whereby said fourth distance is chosen such that at least a portion of said first current flows into the formation of interest; and

said apparatus having means to measure said first resistance and said second resistance;

obtaining said first, second, and third voltage related signals while conducting said first current between said fourth and fifth electrodes;

determining the magnitudes of said first resistance and said second resistance; and

processing the voltage related signals from each of said first, second, and third electrodes to provide information useful to determine the resistivity of the geological formation of interest, said processing taking into account the determined magnitudes of said first resistance and said second resistance to reduce the inaccuracy associated with the determination of the resistivity of the geological formation of interest.

Claim 3. A method for providing information useful to determine the resistivity of a geological formation surrounded by borehole casing comprising the steps of:

(a) causing a first current to flow in a first direction along a predetermined portion of the casing and measuring a plurality of first voltages across said portion of the casing;

(b) causing a second current to flow in a first direction along said portion of the casing and measuring a plurality of second voltages across said portion of the casing; and

(c) using the first and second voltage measurements to provide information useful to determine the resistivity of a said geological formation.

Claim 4. An apparatus for providing information useful to determine the resistivity of a geological formation surrounded by borehole casing comprising the following:

(a) first means to generate and cause a first current to flow in a first direction along a predetermined portion of the casing and second means to measure a plurality of first voltages across said portion of the casing;

(b) third means to generate and cause a second current to flow in a first direction along said portion of the casing and fourth means to measure a plurality of second voltages across said portion of the casing; and

(c) processing means using the first and second voltage measurements to provide information useful to determine the resistivity of a said geological formation.